Reg. No.															

Question Paper Code	13635

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Sixth Semester

Mechanical Engineering

20MEPC601 - DESIGN OF TRANSMISSION SYSTEMS

Regulations - 2020

(Use of PSG Design Data book is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	The included angle for the V-belt is usually (a) 20° – 30° (b) 30° – 40° (c) 40° – 60° (d) 60° – 80°	*1*	*K1*	*CO1*
2.	In the parallel lay ropes, the direction of twist of the wires in the strand is the _____ as that of the strands in the rope. (a) opposite direction (b) same direction (c) none of the above (d) Both a & b	*1*	*K1*	*CO1*
3.	The types of gears used to connect two non-parallel non-intersecting shafts are _____ gears. (a) Spur (b) Helical (c) Bevel (d) spiral	*1*	*K1*	*CO2*
4.	The module is the reciprocal of (a) diametral pitch (b) circular pitch (c) pitch diameter (d) addendum diameter	*1*	*K1*	*CO2*
5.	The root angle of a bevel gear is equal to _____. (a) pitch angle – addendum angle (b) pitch angle +addendum angle (c) pitch angle – dedendum angle (d) pitch angle + dedendum angle	*1*	*K1*	*CO3*
6.	From the following, which material is most widely used for worm gear? (a) Cast steel (b) Copper (c) Phosphor bronze (d) Cast iron	*1*	*K1*	*CO3*
7.	A ray diagram is used in gear box design to represent _____. (a) Speed ratios (b) Gear teeth profile (c) Gear dimensions (d) Kinematic layout	*1*	*K1*	*CO4*
8.	If the structure formula of a gearbox design is z = 2(1) 3(2) 2(6), then the approximate number of gears required will be _____. (a) 12 (b) 14 (c) 16 (d) 18	*1*	*K1*	*CO4*
9.	The following is known as a positive clutch (a)single plate clutch (b) cone clutch (c) jaw clutch (d) centrifugal clutch	*1*	*K1*	*CO5*
10.	Which of the following materials is commonly used for brake linings? (a) Cast iron (b) Bronze (c) Ceramic (d) Steel	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	How will designate a V-belt?	*2*	*K1*	*CO1*
12.	Explain chordal action in chain drives.	*2*	*K2*	*CO1*
13.	State Law of Gearing.	*2*	*K1*	*CO2*
14.	Write any two applications of a skew gear-drive.	*2*	*K1*	*CO2*
15.	When do we use bevel gear?	*2*	*K1*	*CO3*
16.	How can you specify a pair of worm gears?	*2*	*K1*	*CO3*
17.	What is step ratio?	*2*	*K1*	*CO4*
18.	What is the structural diagram of a gear box?	*2*	*K1*	*CO4*
19.	Why are cone clutches better than disc clutches?	*2*	*K1*	*CO5*
20.	What factors should be considered when designing friction clutches?	*2*	*K1*	*CO5*

21.	List the different types of brakes.	*2*	*K1*	*CO6*
22.	How does the function of a brake differ from that of a clutch?	*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Design a Flat Belt Drive to transmit 10 kW at 1500 rpm to a line shaft to run at 500 rpm. Approximate centre distance is 2m. The diameter of larger pulley is 750 mm.	*11*	*K3*	*CO1*
		OR			
	b)	A 7.5kW electric motor running at 1400 rpm is used to drive the input shaft of the gear box of a machine. Design a suitable roller chain to connect the motor shaft to the gear box shaft to give exact speed ratio of 10:1. The center to center distance of the shaft is approximately 600mm.	*11*	*K3*	*CO1*
24.	a)	A 27.5 kW power is transmitted at 450 rpm to a shaft running approximately at 112 rpm through a spur gear drive. The load is steady and continuous. Design the gear drive and check the design.	*11*	*K3*	*CO2*
		OR			
	b)	A pair of helical gears is to be designed to transmit 30 kW at a pinion speed of 1500 rpm. The velocity ratio is 3. Selecting 15Ni2Cr1Mo15 steel as the material. Determine the dimensions of the gears.	*11*	*K3*	*CO2*
25.	a)	Design a Bevel Gear Drive to transmit 9 kW at 20 rps of the pinion. Gear ratio is 3. Material for Pinion and Wheel is C 20 steel. Assume Life = 10,000 hours.	*11*	*K3*	*CO3*
		OR			
	b)	Design a worm gear drive to transmit 22.5 kW at a worm speed of 1440 rpm. Velocity ratio is 24:1. An efficiency of atleast 85% is desired.	*11*	*K3*	*CO3*
26.	a)	A Six Speed Gear Box is to provide a speed range of 100 rpm to 1000 rpm. Draw the Speed Diagram & Kinematic Layout.	*11*	*K3*	*CO4*
		OR			
	b)	A 9 Speed Gear Box is to give output speeds ranging from 100 rpm to 630 rpm. Draw the Structural Diagram & Kinematic Layout.	*11*	*K3*	*CO4*
27.	a)	A multi-plate clutch, effective on both sides transmits 30 kW at 360 rpm. The inner radius of contact surface is 100mm and outer radius is 200mm. The effective coefficient of friction is 0.25. An axial load of 600 N is applied. Assuming uniform wear conditions, find the number of discs required and the intensity of maximum pressure developed.	*11*	*K3*	*CO5*
		OR			
	b)	Determine the principal dimensions of a cone clutch faced with leather to transmit 30 kW at 750 r.p.m. from an electric motor to an air compressor. Assume: semi-angle of the cone = 12.5°; μ = 0.2; mean diameter of cone = 6 to 10 d where d is the diameter of shaft; allowable normal pressure for leather and cast iron = 0.075 to 0.1 N/mm^2; load factor = 1.75 and mean diameter to face width ratio = 6.	*11*	*K3*	*CO5*

28. a) A double shoe brake as shown in the figure -1 is capable of absorbing a torque of 1400 N-m. The diameter of the brake drum is 350 mm and the angle of contact for each shoe is 100°. If the coefficient of friction between the brake drum and lining is 0.4, find (i) the spring force necessary to set the brake and (ii) the width of the brake shoe, if the bearing pressure on the lining material is not to exceed 0.3 N/mm^2. *11 K3 CO6*

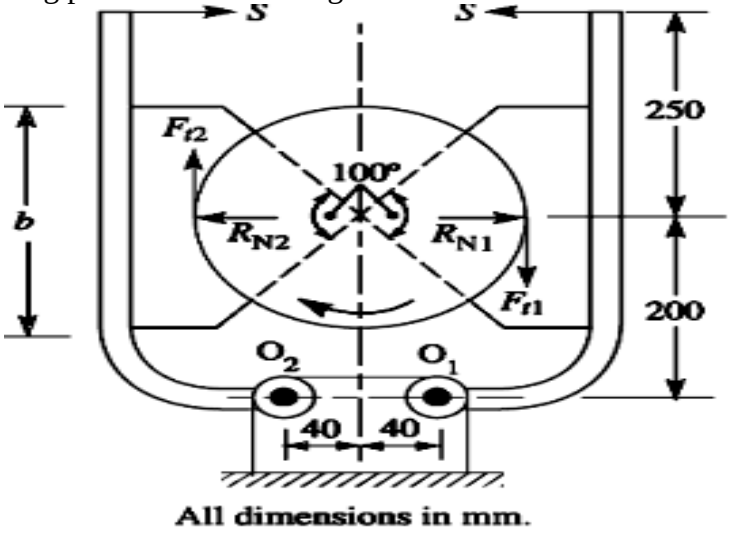

Figure -1

OR

b) Design a differential band brake as shown in figure-2 for a which lifting a load of 20kN through a steel wire rope wound around a barrel of 600mm diameter. The brake drum, keyed to barrel shaft, is 800mm diameter and the angle of lap of the band over the drum is about 240°. Operating arms of the brake are 50mm and 250mm. The length of operating lever is 1.6m**.** *11 K3 CO6*

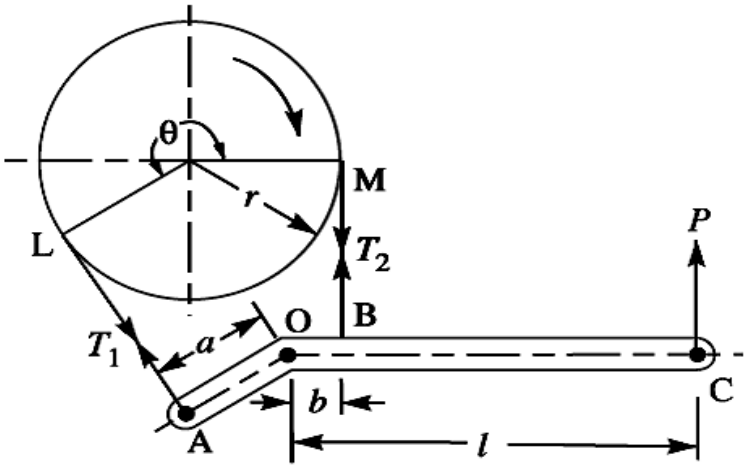

Figure-2